TIMER-A

Style 50D584

For Type UM 771 & UM 775 Reflectoscopes

OPERATING & MAINTENANCE

MANUAL NO. OM50D584

Sperry®

AUTOMATION INDUSTRIES, INC.

SPERRY DIVISION

DANBURY, CONN., U. S. A.

CONTRACT NO. N00600-70-C-0204

TIMER-A

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MANUAL NO. OM50D584

MODEL NO...50D584
BOOK.....3 of 3.

AUTOMATION INDUSTRIES, INC.

SPERRY DIVISION

DANBURY, CONN., U. S. A.

MARCH 1970

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FIGURE 1-1 TIMER-A PLUG IN UNIT

CHAPTER 1

INTRODUCTION

1.1 PURPOSE

The Timer-A Plug-In Unit is used in ultrasonic nondestructive testing. The Timer-A is designed to provide synchronizing signals for the Pulser/Receiver; for the generation of the horizontal time base sweep; for controlling the alternate trace; for controlling the sweep delay; and controlling the trace position. The Timer-A Plug-In Unit also automatically sets the pulses per second for maximum trace brightness at any Timer-A sweep control setting.

1.2 SCOPE

The various sections include a general description, preparation for use, operation, electrical description and maintenance procedures for the Timer-A Unit. Supplemental data such as parts list and schematic are included at the rear of this manual in the appendix sections.

1.3 DESCRIPTION OF EQUIPMENT

The Timer-A Plug In Unit is an all solid state, highly versatile timing device used with the UM-771/775 Reflectoscope. It features an accurate sweep and sweep delay range push button control, a two mode (longitudinal and shear wave) push button control, and a material calibration control. Ultrasonic inspection, with the Timer-A, Pulser/Receiver and UM 771/775 Reflectoscope, may be applied to three classes of material inspection.

a. Detection and location of internal and surface discontinuities or inhomogeneities in materials, weldments and bonds.

b. Measurements of material thickness.

c. Determination of differences in structure and physical properties.

1.3.1 Sweep Delay - The sweep delay (inches) consists of a push button course and a vernier control providing sweep delay from 0 to 200 inches. The sweep delay is calibrated for steel only.

1.3.2 Sweep Length - The sweep length (inches/division) consists of a push button course and a vernier control providing sweep from 0 to 500 inches. The sweep length can be calibrated for various materials.

1.3.4 Mode - A single push button control provides for a longitudinal or shear wave sweep calibration.

1.4 SPECIFICATION

1.4.1 Mechanical Specification - The Timer-A plugs into the lower left Timer function slot of the UM-771/775 Reflectoscope. Contact is made by plugging connector P402 to the Deflection amplifier P.C. Board Assembly. The Timer unit is easily removed for servicing or interchanging by releasing the lock catch on the front panel, disconnecting Timer interconnect Cable P402 and then sliding the unit out.

1.4.1.1 Module Timer-A front plug-in size. Single width module 2-3/8" H 8" W and 20-1/4" L.

1.4.1.2 Weight 2-1/2 pounds.

1.4.1.3 The following front panel controls are provided:

a. Sweep range

1. Sweep range push button .02-.1-.5-2-10 in/div
2. Sweep range vernier - CAL through X5

b. Sweep Delay

1. Sweep delay push button 0-2-20 inches
2. Sweep delay vernier - CAL through X10

c. Mode

1. Longitudinal
2. Shear

d. Sweep Trace positioning

1. Vertical
2. Horizontal
3. Alternate Vertical

e. Rate - 100 to 2,000 pps.

f. Material - Calibrate control for various Material from Teflon to Aluminum

1.4.2 Electrical Specification

Power Requirements - All power requirements to operate the Timer-A are obtained from the UM-771/775 Reflectoscope Display.

Total Sweep Calibration - 700 inches of steel.

Mode Wave Switch - Longitudinal or Shear wave (calibrated in steel only).

Temperature Range -28.9° C to 71.1° C (-20° F to 160° F).

CHAPTER 2

PREPARATION FOR USE

2.1 GENERAL

This chapter contains unpacking, handling, installation procedures and initial Timer-A check out procedures. These steps should be followed to assure optimum operating conditions.

2.2 UNPACKING AND HANDLING

If the Timer-A is shipped with a UM-771/775 Reflectoscope, the Timer-A will be secured in the proper slot within the Reflectoscope. The UM-771/775 Reflectoscope will be shipped in a molded rubberized hair nest within a cardboard container. If the Timer-A is shipped alone, it will be shipped in a cardboard container. Both of these packages have been fully tested and will absorb any normal amount of shocks due to careless handling while in shipment. Remove the units (Reflectoscope and/or Timer-A) and all accessories from the shipping container and perform a visual inspection. If any damage is found, immediately contact the carrier and the area representative for Automation Industries, Inc., Sperry Division. Do not destroy the shipping container until a satisfactory inspection has been completed. It is suggested that the shipping container be retained for future use.

2.3 PREPARATION FOR USE

For proper installation of the Timer-A unit for bench operation, proceed as follows:

a. The Timer-A does not require any special procedure for preparation for use. Simply plug the unit into the assigned slot in the UM-771/775 Reflectoscope and connect P402. (Top cover must be removed in order to connect P402.)

b. Observe that all front panel push buttons and controls are visually free moving and operational.

c. Energize UM-771/775 Reflectoscope. Power is automatically supplied to the unit from the main chassis.

d. Refer to Chapter 3, Section 3.2 for general operation of Timer A controls and functions.

CHAPTER 3

OPERATION

3.1 GENERAL

The purpose of this chapter is to give the operator instruction for control functions, set up and operation of the Timer-A. It is recommended that the inexperienced operator thoroughly read and study this section prior to operating the equipment. An introduction to ultrasonic Reflectoscope method of nondestructive testing is located in Appendix B of the UM-771/775 Reflectoscope Manual No. and is also suggested reading material for the novice operator.

3.2 CONTROLS AND CONNECTORS

The controls found on the Timer-A are illustrated in Figure 3-1 and tabulated in Table 3-1.

TABLE 3-1

CONTROLS AND CONNECTORS

Item No.	Control	Function
(1)	Sweep Delay (Slide and Push Button Control)	There are two controls in this group. SWEEP DELAY VERNIER and SWEEP DELAY COARSE. The sweep Delay Vernier is a single continuous wiper control which varies from (CAL) to (X10). The Sweep Delay Coarse control is a three position push button switch. Ranges are 0, 2, and 20 in Sweep Delay inches. Total Delay range is from 0 to 200 inches of steel. (Sweep Delay controls are Calibrated for steel only.)
(2)	Mode (Push Button Control)	Two position single push button (in for shear, out for longitudinal). With the MODE button out, the sweep can be calibrated for longitudinal or shear velocities in various materials. After calibrating the sweep for longitudinal wave testing in steel, the MODE button can be pushed in to SHEAR position. The sweep is now calibrated for shear testing in steel or any other material with a 1.85:1 longitudinal/shear velocity ratio.

TABLE 3-1 (Cont'd)

Item No.	Control	Function
(3)	Sweep Range (Slide and Push Button Control)	There are two controls in this group. SWEEP RANGE VERNIER and SWEEP RANGE COARSE. The sweep Range Vernier (Wiper arm control) permits continuous selection from (CAL) to (X5) sweep range. The Sweep Range Coarse control is a five position push button switch control. Sweep push button ranges are .02-.1-.5 -2 and 10 inches/Div: Total sweep range is from .02 to 50 inches/Major Division.
(4)	Material (MAT'L) (Screwdriver Control)	This screwdriver adjustment control will provide material calibration for most commonly used materials. Since velocities vary in different types of material, an accurate display calibration can be obtained by setting the mat'l control to a Reference Standard material Block.
(5)	RATE (Screwdriver Control)	This screwdriver adjustment permits fine control of the pulse rate of 100 to 2,000 Hz range. A lockout feature is provided to step down the repetition rate for long sweep delay and sweep times. Thus allowing maximum Rep. rate (Maximum brightness) for all testing conditions.
(6)	ALTERNATE (ALTN) (Screwdriver Control)	This screwdriver adjustment controls the vertical position of the alternate trace (DAC) with respect to the main display trace. Thus if a DAC signal is present, it can be positioned as desired.

(Continued)

TABLE 3-1 (Cont'd)

Item No.	Control	Function
7	Horizontal (Horiz) (Screwdriver Control)	This screwdriver adjustment controls the horizontal (left to right) positioning of both the main and alternate traces.
8	Vertical (Vert.) (Screwdriver Control)	This screwdriver adjustment controls the vertical (up and down) positioning of both the main and alternate traces.

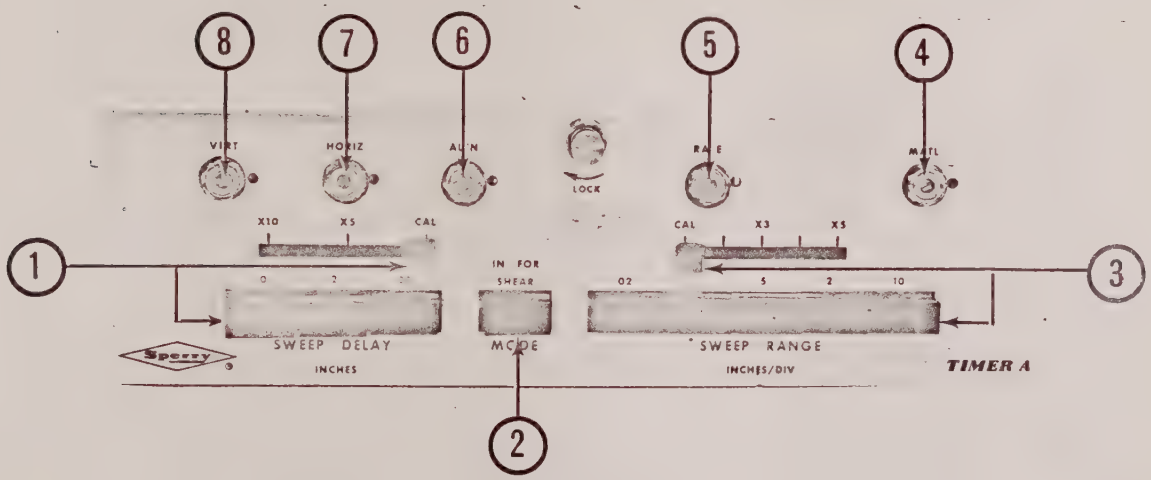


Figure 3-1 Timer-A Front Panel Controls

3.3 OPERATION PROCEDURE

The Timer-A has a wide range of applications. Therefore, no detail operating procedures can be given; however, a familiarization procedure which will allow the operator to see how the various controls function, is provided. For various Ultrasonic Testing Techniques, refer to UM-771/775 Reflectoscope Manual No. OM50R075.

NOTE

It must be kept in mind that this is not an actual operating procedure, but simply a familiarization procedure which will enable the user to properly use the Timer-A unit when required to.

a. Assemble the following for Contact Test Set-up:

1. UM-771/775 Reflectoscope
2. Pulser/Receiver
3. Cable and Search Unit
4. Aluminum Test Blocks (1/2 - 1 and 10 inch)
5. Steel Test Block - 1 inch

If the Timer-A unit has to be removed completely from the UM-771/775 Reflectoscope, turn power OFF when connecting or disconnecting plug P402 from UM-771/775 Reflectoscope Deflection P.C. Board.

b. Obtain a trace on the CRT with initial echo pulse and first echo from the test specimen.

NOTE

Use proper screwdriver 3/32 inches wide for steps C through G.

c. Vertical - The vertical positioning control should position the main trace about 3/4 inch above and 1/4 inch below the zero inch reference line. Adjust vertical positioning so the main trace is at the zero inch reference line.

d. Horizontal - The horizontal positioning control should position both main and alternate sweep traces about 3 major divisions to the left and to the right of center on the CRT screen. Adjust the horizontal positioning so the start of the traces is at the extreme left major division.

e. Alternate Vertical - The alternate vertical positioning control should position only the alternate trace about 1 inch above and 1/2 inch below the zero inch reference line. Adjust alternate vertical control for a trace just below main trace (for clarity).

f. Rate - Adjust rate control from CCW to CW. Note the brightening of the trace as the rate becomes faster.

g. Material - The material control adjustment will vary the display calibrations with the many different types of materials under test. When performing an ultrasonic test, calibrate the UM-771/775 Reflectoscope Timer-A for the specific material under test if possible. See Chapter 5, Section 5.2.6 for calibrating Timer-A for aluminum.

NOTE

CAL (Calibrate) Vernier Controls are equal to an exact multiplier factor of one (X1) on Sweep Range and Sweep Delay positions. When the Vernier controls are other than in the CAL position, the multiplier factor is only an approximation number.

NOTE

One or more Push Buttons on the Sweep Range Control may be pushed simultaniously and the corresponding sweep range values may be added.

h. Sweep Range - Using the 1" aluminum test block, vary the sweep range and note the Variation in Sweep Length. To check the 10 inches/division sweep range, use a 10" aluminum Test Block.

i. Mode - Set the controls as follows:

1. Mode.....Long. (Out)
2. Sweep Range.....Vernier (CAL), Coarse .1
3. Sweep Delay.....Vernier (CAL), Coarse 0
4. Vert. & Horiz.....As required
   Use 1/2" steel test block.

Note the position of the first echo should be on the fifth major division. Adjust material control if necessary. Press Mode switch to Shear. The second echo should fall approximately on the fifth major division. The Shear position is calibrated for steel but it can be used as an approximation for other materials.

j. Sweep Delay - The Sweep Delay is calibrated for steel. Set the controls as follows: (Push only one button at a time)

1. Mode.....Long
2. Sweep Range.....Vernier (CAL), Coarse .5
3. Sweep Delay.....Vernier (CAL), Coarse 0
   Use 1" steel test block.

k. Note the position of the first and second echoes. Press in Sweep Delay Pushbutton No. 2. The Sweep starts where the second echo finished. Operate various Sweep Delay controls and note the presentation.

CHAPTER 4

ELECTRICAL DESCRIPTION

4.1 GENERAL

The following paragraphs include a general and detailed functional theory of operation of the Timer-A. During the following discussion reference should be made to the Timer-A. Block Diagram Figure No. 4-1 and Schematic No. 50D537.

4.2 THEORY OF OPERATION - GENERAL

4.2.1 RATE GENERATOR AND SYNC SECTION

All timing functions begin with the Rate Generator. The Rate Generator is an oscillator whose repetition rate is controlled by the front panel RATE Control. The output pulses of the Rate Generator are sent to the Sync Trigger Amplifier which amplifies and inverts the signals and sends them to the Sync Delay monostable multivibrator. As each Rate Generator pulse is received at the sync delay mono, it flips this multivibrator into its unstable or timing state. The output of the monostable is sent to the early sync bistable which flips to one of its stable states and a signal is sent to the early sync amplifier and the output of this amplifier is fed to pin S of the timer plug. This is the early sync output of the Timer. Returning to the sync delay monostable is still in its timing state. Approximately twenty micro seconds after early sync time, the monostable flips back to its stable state. A signal is sent to the pulser sync bistable which has been previously set to the proper conditions by the early sync bistable. The pulser sync bistable is flipped and a pulse is sent to the pulser sync amplifier. The output of the amplifier is sent to pin N of the timer plug which is the pulser sync output of the timer. The pulser sync is approximately 180^0 out of phase and shifted approximately twenty micro-seconds from the early sync.

4.2.2 SWEEP DELAY SECTION

The Sync Trigger Amplifier output is also fed to the sweep delay bistable. The bistable flips at rate generator time and the output of this bistable is sent to the Sweep Delay gate and ramp generator. A ramp is generated whose duration is determined by the front panel Sweep Delay Course and front panel Sweep Delay Vernier Controls. A negative going ramp is sent to the sweep delay emitter follower whose output is also a negative going ramp which is coupled back to the sweep delay bistable. When the negative going ramp reaches the trip point of the sweep delay bistable, the bistable flips to its original state. The negative output of the sweep delay bistable, which is delayed in time from

the early sync by the sweep delay time, is then sent to the sweep bistable.

4.2.3 SWEEP AND UNBLANK SECTION

The negative output of the sweep delay bistable flips the sweep bistable and a signal is then sent to the sweep gate and ramp generator. Here a ramp is generated whose duration is determined by the Sweep Range Course and Vernier Control, the Material control, and the Mode Switch, all being front panel controls. The sweep ramp is sent to the sweep emitter follower whose output is also negative going ramp which is coupled back to the sweep bistable. As in the sweep delay section the negative ramp reaches the trip point of the sweep bistable and flips this bistable back to its original position, thus terminating the ramp. The output of the sweep emitter follower is also sent to a sweep inverter which inverts this negative going ramp to a positive going ramp. The output of the sweep inverter is sent to the sweep output emitter follower and then to pin H of the timer plug. This is the sweep output of the timer. Returning to the sweep gate and ramp generator a second output of this circuit is a square wave with a duration identical to the sweep time. This square wave is sent to the unblank emitter follower and the output of this circuit goes to pin L of the timer plug. This is the sweep unblank signal of the Timer.

4.2.4 LOCK OUT FEATURE

A lock out feature is provided in the timer in order to prevent more than one main bang from appearing on the CRT at any one time. This condition exists with long sweep times and fast rep-rates. Outputs from both the sweep delay gate and sweep gate are sent back to the rate generator and lock out circuit. These signals prevent the rate generator from sending out any more sync pulses until both the sweep delay and the sweep times are over.

4.2.5 POSITIONING CONTROLS

The vertical front panel control positions both the main and alternate traces vertically on the CRT screen. The horizontal front panel control positions both main and alternate traces horizontally on the screen. The alternate front panel control positions only the alternate trace vertically on the CRT screen.

4.2.6 POWER SUPPLIES

The power supply inputs to the Timer are the +12V and the -12V regulated supplies. Within the Timer, the +12V is used to develop +10V and +5V regulated supplies. The -12V is used to develop -10V and -5V regulated supplies. These supply voltages are used internally in the Timer with the +5V also being used in the Deflection Amp Board.

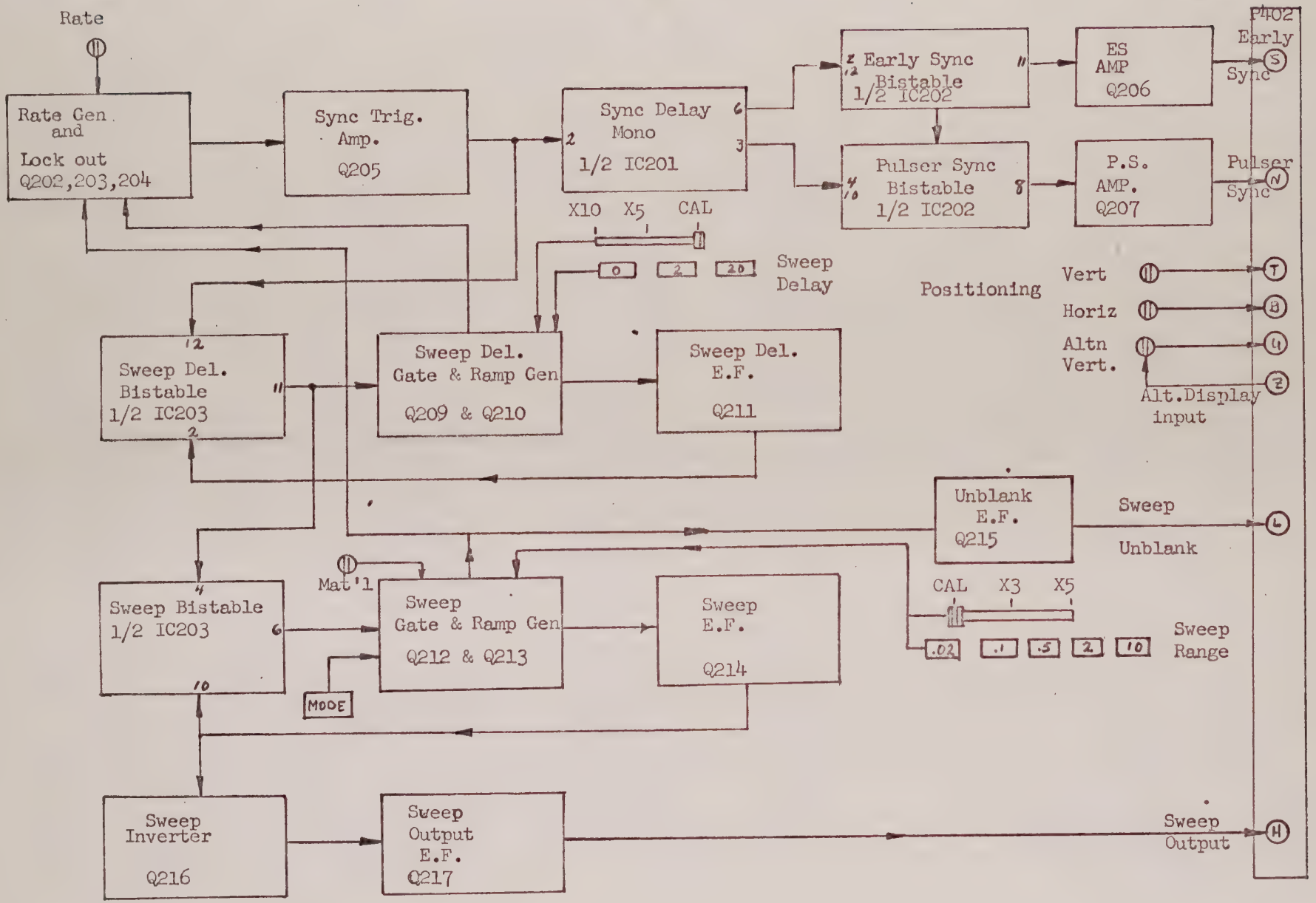


Figure 4-1 BLOCK DIAGRAM OF TIMER-A

CHAPTER 5

MAINTENANCE

5.1 GENERAL

The following paragraphs contain information for use in preventive maintenance, and troubleshooting of the Timer-A Unit.

5.2 PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, lubrication, and recalibration. Preventive maintenance performed on a regular basis will help prevent instrument failure and will improve the reliability of this instrument. The severity of the environment which the Timer-A Unit is subject will determine the frequency of maintenance.

5.2.1 CLEANING

The unit should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation. It also provides an electrical conduction path.

5.2.2 EXTERIOR

Loose dust accumulated on the outside of the unit can be removed with a soft cloth or small paint brush. The paint brush is particularly useful for dislodging dirt on and around the controls. Dirt which remains can be removed with a soft cloth dampened in a mild solution of water and detergent. Abrasive cleaners should not be used.

5.2.3 INTERIOR

Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air. Remove any dirt which remains with a soft paint brush or a cloth dampened with a mild water and detergent solution. A cotton-tipped applicator is useful for cleaning in narrow spaces or printed circuits.

5.2.4 LUBRICATION

No lubrication necessary and none should be attempted.

5.2.5 VISUAL INSPECTION

The unit should be inspected occasionally for such defects as broken connections, improperly seated transistors, and heat damaged parts. The remedy for most visible defects is obvious; however, particular care must be taken if heat damaged parts are located. Overheating is usually only a symptom of trouble. For this reason, it is essential to determine the actual cause of overheating before the heat damaged parts are replaced; otherwise the damage may be repeated.

5.2.6 Calibrating the sweep range on Timer-A for various materials from Teflon to Aluminum.

a. Using 1/4" and 1" Aluminum test block, set the following controls:

1. Vert. and Horiz. - as required
2. Sweep Delay - Coarse 0 Vernier (CAL)
3. Sweep Range - Coarse .1 Vernier (CAL)
4. Mode - Out (Long)

b. Place search unit on the 1/4" test block and position peak of the first back reflection for 2 1/2 major divisions using Horizontal positioning control.

c. Place search unit on the 1" test block and adjust Material control so that the peak of the first back reflection is at the 10th major division.

d. Repeat steps b. and c. as required.

5.3 TROUBLESHOOTING

5.3.1 Troubleshooting is the process by which the cause of a malfunction is discovered by means of a systematic procedure. Most malfunctions which will occur in the Timer A unit will be electrical in nature. First, a thorough knowledge and understanding of the Timer-A is a prerequisite. Second, check to see that all switches and controls are in the correct position.

5.3.2 The following guide could help localize a particular trouble within the Timer-A unit.

a. Troubleshooting Guide, Table 5-1.
b. Wave forms, Chart 5-1.
c. Photograph, Figure 5-1.

Always begin troubleshooting by making a visual inspection of the the Timer-A P. C. Board. Check for any loose or burned components, loose wire connections, and controls not functioning properly.

CAUTION

Avoid shorting power supply, voltage or components when measuring voltages or wave forms.

5.3.3 TEST AND ASSOCIATED EQUIPMENT

The following test and associated equipment is required for checking the Reflectoscope.

a. Servistension Style 50C549
b. Tektronix 531 or equivalent recently calibrated.
c. Simpson Model 260, recently calibrated. High voltage Probe

5.3.4 REPLACEMENT OF DEFECTIVE PART

All electrical components are accessible for replacement from the printed circuit board assembly. The P. C. Board is double etched circuit and electrical components are hole through mounted. Before the component is removed from the P. C. Board special consideration should be followed:

a. Use low heat soldering iron (35 to 55 watts and less than 700°F usable temperature)

b. Use small diameter solder (60/40). Clean the surrounding area thoroughly after rosin solder is used.

NOTE

DO NOT USE ACID CORE SOLDER

c. Care should be taken to avoid damage to the circuit board by applying too much heat or solder. Avoid ripping the printed board conductor leads.

d. If small diodes are to be removed or reinstalled, use a heat sink on the component lead between the soldering iron and the component body.

e. If the component is burnt, clip off the leads, flush to the P.C. board and remove unclipped leads from opposite side of P.C. Board.

f. Clear solder hole on the P.C. Board.

g. Reinstall component leads and clip to proper length.

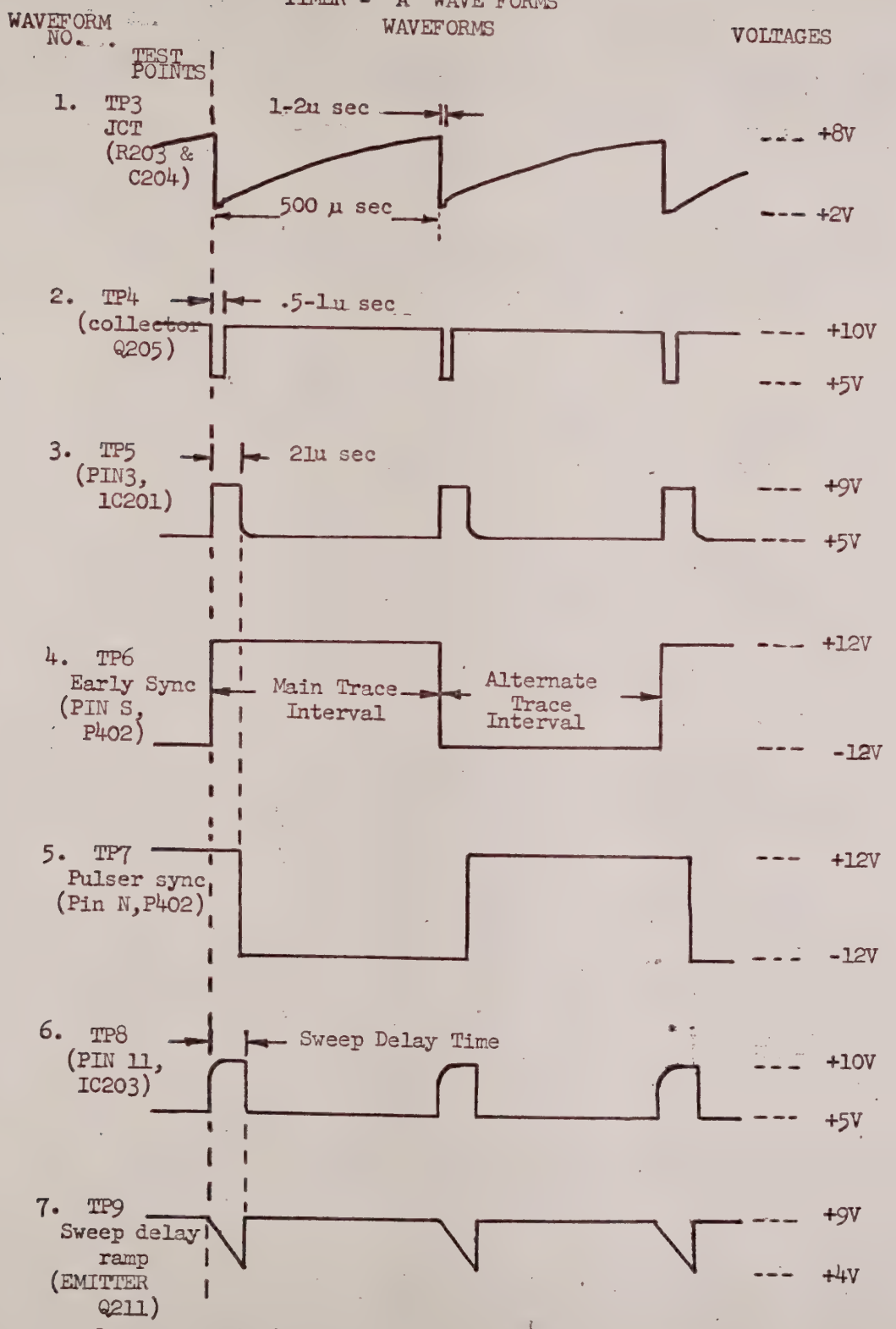
h. Resolder component, again avoid excess heat.

TABLE 5-1

TROUBLESHOOTING GUIDE
(Assuming Pulser/Receiver is operational)

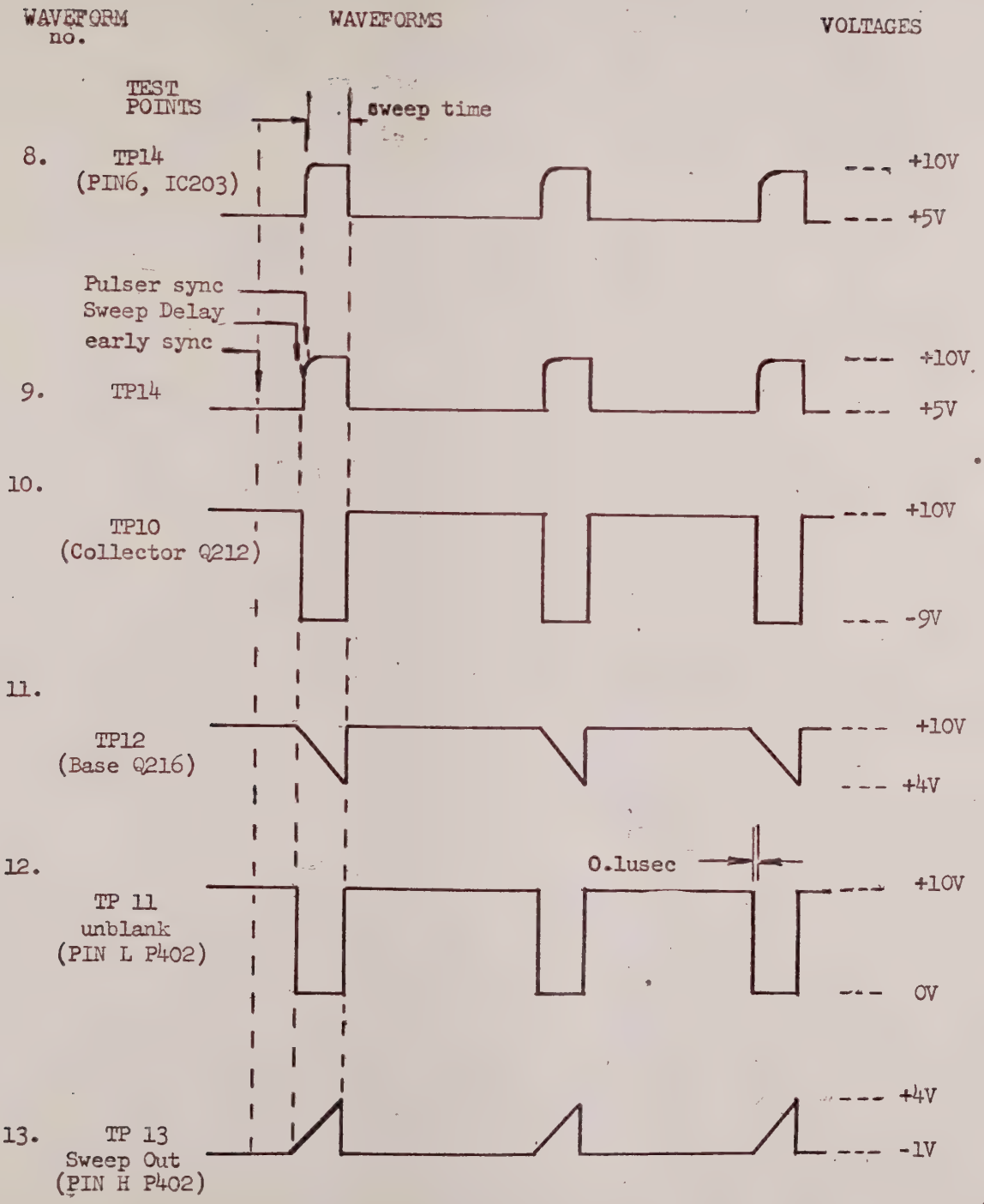
MALFUNCTION	PROBABLE CAUSE	REMEDY
No sweep on CRT	Push buttons on sweep and sweep delay are not "IN"	Buttons on the sweep and sweep delay must be in the IN position
	Positioning adjust controls not mid-range Defective sweep range Coarse push button control S203	Adjust horizontal and vertical controls replace S203
	Defective Q213 and Q214	See Chart 5-1 Check waveform No.11 at the base of Q216. Replace Q213 and Q214
	Defective rate Gen. Section Q202 thru Q205	Replace any of all defective transistors Q202 thru Q205
	Power Supply ± 12V input, ± 10V and ± 5V output	Check voltages at timer and low voltage power supply
Sweep but no Video	Defective pulser Sync section	Replace any of all defective IC201, IC202 and Q207
Sweep and early sync operational, no Video	Defective Pulser, sync output transistor	Replace Q207
No sweep unblank output	Defective sweepgate and ramp. Gen.	Replace any of all defective transistors Q212 thru Q215
No sweep output. Sweep unblank operative.	Defective Q214, Q216 and Q217	Replace any of all defective transistors Q214, Q216 and Q217
Sweep erratic on various sweep ranges	Dirty rate control R101	Replace R101

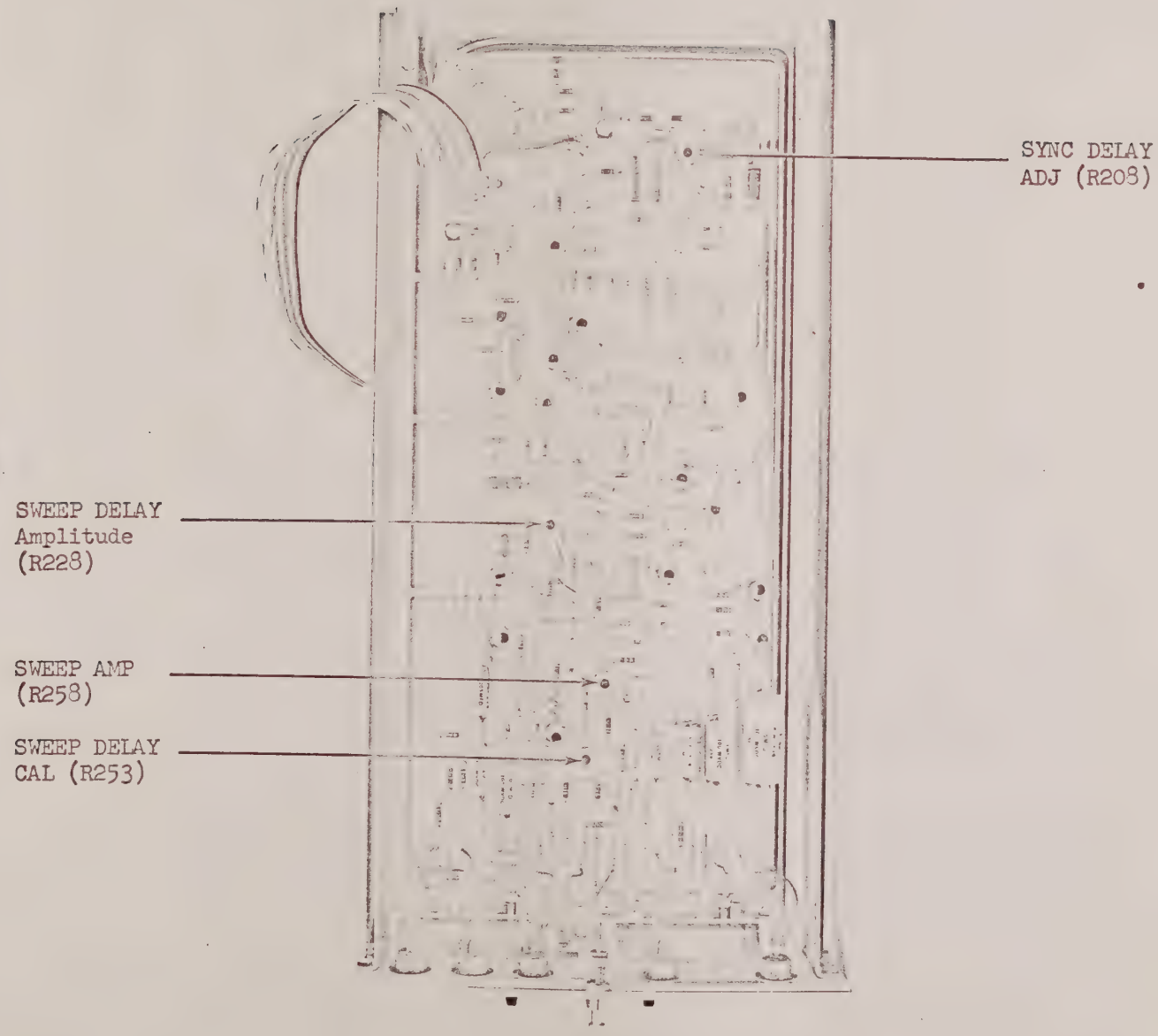
CHART 5-1
TIMER - A WAVE FORMS



CONTINUED

CHART 5-1
TIMER-A WAVEFORM (cont'd.)





TIMER-A

Figure 5-1 P. C. Board Alignment Controls Identification

APPENDIX A

PARTS LIST

A1.0 INTRODUCTION

A1.1 This section contains information for ordering and replacing parts for the Timer-A Unit.

A1.2 For parts identification on the P.C. Board, photos and parts break down list will be included.

A2.0 ORDERING INFORMATION

In ordering a replaced part from Sperry Division, address the parts order list or inquiry to the Automation Industries, Inc., Sperry Division, Danbury, Connecticut, U.S.A. and supply the following information:

a. Sperry Instrument Model Number
b. Serial Number
c. Desired quantity of parts
d. Schematic symbol, part number and description.

A3.0 PARTS LIST (TABLE A-1)

Table A-1 contains a list of parts in Alpha numerical order. The following information for each part will be given:

a. Schematic Symbol
b. Part Number
c. Description

A3.1 Description of component parts given in Table A-1 are as complete as possilbe to help assist in procurring the part other than Sperry Division. However, many parts are manufactured only by Sperry Division and therefore are available at Sperry. Contact the Automation Industries, Inc., Sperry Division, Danbury, Connecticut, U.S.A., Sales/Service Office.

A3.2 For parts identification other than P.C. board, front panel controls, additional parts breakdown list with photographs Figure A 1 and A 2 will be included with Table A-2. The following information will be given:

a. Schematic Symbol
b. Part Number
c. Description

TABLE A-1

PARTS BREAKDOWN LIST

Schematic Symbol	Part Number	Description
C201	K68E15	Capacitor, 68uf, 15V
C202		Capacitor, 22uf, 6V
C203	Same as C201	
C204	DM-20-682	Capacitor, 6800pf
C205	5GA-T20	Capacitor, 200pf
C206	Same as C205	
C207	5GA-T75	Capacitor, 750pf
C208		Capacitor, 22uf 6V
C209	Same as C201	
C210		Capacitor, .05uf, 100V, Balco ± 1%
C211	Same as C207	
C213	Same as C207	
C214	Same as C207	
C215	Same as C207	
C216		Capacitor, 33uf 15V
C217	5GA-T30	Capacitor, 300pf
C218	Same as C217	
C219	Same as C202	
C220	same as C201	
C221	Same as C201	
C222	Same as C207	
C223		Capacitor, 330pf, 500V ±2%
C224	Same as C205	
C225	Same as C201	
C226	5GA-Q50	Capacitor, 50uf
C227	5GA-T10	Capacitor, 100pf
C228	Same as C202	
C229		Capacitor, .0005uf, 100V, Balco ±1%
C230		Capacitor, .009uf, 100V, Balco ±1%
C231	Same as C210	
C234		Capacitor, .001uf, 100V, Balco ±1%
C235	Same as C229	
C236		Capacitor, .025uf, 100V, Balco ±1%
C233		Capacitor, .5 uf, 100V, Balco ±1%
C239	Same as C202	
C240	Same as C202	
C327		Capacitor, .1 uf, 100v, Balco ±1%
C233	Same as C216	
CR201	IN4733 A	Diode
CR202	Same as CR201	
CR203	IN 914 A	Diode
CR204	Same as CR201	
CR205	Same as CR203	
CR206	Same as CR203	
CR207	Same as CR203	
CR208	Same as CR203	
CR209	Same as CR201	
CR210	Same as CR201	

(Continued)

TABLE A-1

PARTS BREAKDOWN LIST

Schematic Symbol	Part Number	Description
CR211	Same as CR201	
CR212	Same as CR203	
CR213	Same as CR203	
CR214	Same as CR203	
CR215	Same as CR203	
CR216	Same as CR203	
CR217	Same as CR203	
CR218	Same as CR203	
CR219	Same as CR203	
CR220	Same as CR203	
CR221	Same as CR203	
CR222	Same as CR203	
CR223	Same as CR203	
CR224	Same as CR203	
CR226	IN4736	Diode
CR227	Same as CR203	
CR228	Same as CR203	
Q201	2N4921	Transistor
Q202	2N3904	Transistor
Q203	2N3906	Transistor
Q204	2N4871	Transistor
Q205	Same as Q202	
Q206	Same as Q202	
Q207	Same as Q202	
Q208	2N4918	Transistor
Q209	Same as Q203	
Q210	2N5089	Transistor
Q211	2N5087	Transistor
Q212	Same as Q203	
Q213	Same as Q210	
Q214	Same as Q211	
Q215	Same as Q203	
Q216	Same as Q203	
Q217	Same as Q202	
R101	WA1G012S504MA	Potentiometer, 0.5M
R102	LIN EAG	Potentiometer, 10 K
R103	WA1G012S502MA	Potentiometer, 5 K
R104	Same as R102	
R105	Same as R103	
R106	Same as R103	
R107	Same as R103	
R208	ABSV2521	Potentiometer, 2.5 K
R228	ABSV5025	Potentiometer, 2.5 K
R253	Same as R228	
R258	Same as R228	

TABLE A-1

PARTS BREAKDOWN LIST

Schematic Symbol	Part Number	Description
R201		27 ohm 1/2 W ± 5% Resistor
R202		91 ohm 1 W ± 5% Resistor
R203		22 K 1/4 W ± 5% Resistor
R204		100ohm 1/4 W ± 5% Resistor
R205		1 K 1/4 W ± 5% Resistor
R206	Same as R205	
R207	Same as R205	
R209		10 K 1/4 W ± 5% Resistor
R210	Same as R203	
R211		8.2 K 1/4 W ± 5% Resistor
R212	Same as R211	
R213	Same as R203	
R214		5.1 K 1/4 W ± 5% Resistor
R215		510 ohm 2 W ± 5% Resistor
R216	Same as R215	
R217	Same as R201	
R218	Same as R202	
R219		330 ohm 1/4W ± 5% Resistor
R220	Same as R219	
R221	Same as R205	
R222	Same as R203	
R223	Same as R209	
R224	Same as R209	
R225	Same as R214	
R226	Same as R214	
R227	Same as R205	
R229		1.5 K 1/4 W ± 5% Resistor
R230	Same as R229	
R231	Same as R205	
R232		1 K 1 W ± 5% Resistor
R233	Same as R205	
R234		510 ohm 1/4W ± 5% Resistor
R235	Same as R215	
R236	Same as R205	
R237	Same as R232	
R238		3.9 K 1/4 W ± 5% Resistor
R239	Same as R235	
R240		2.4 K 1/4 W ± 5% Resistor
R241		1.2 K 1/4 W ± 5% Resistor
R242		15 K 1/4 W ± 5% Resistor
R243	Same as R240	
R244	Same as R205	
R245		22 ohm 1/4 W ± 5% Resistor
R246	Same as R205	
R247		2 K 1/4 W ± 5% Resistor
R248		2.7 K 1/4 W ± 5% Resistor
R249		6.2 K 1/4 W ± 5% Resistor

(Continued)

TABLE A-1 (Cont'd)

PARTS BREAKDOWN LIST

Schematic Symbol	Part Number	Description
R250	Same as R204	
R251	Same as R242	
R252		
R254	Same as R235	11 K 1/4 W ±5% Resistor
R255		
R256		1.1 K 1/4 W ±5% Resistor
R257	Same as R240	51 K 1/4 W ±5% Resistor
R259	Same as R229	
R260	Same as R252	
R261		
R262		3 K 1/4 W ±5% Resistor
R263	Same as R205	1.3 K 1/4 W ±5% Resistor
R264	Same as R240	
R265		
R266	Same as R256	51 ohm 1/4 W ±5% Resistor
R267	Same as R241	
R268	Same as R205	
R269	Same as R249	
R270		
R271	Same as R214	2.2 K 1/4 W ±5% Resistor
R272		
R273		9.1 K 1/4 W ±5% Resistor
R274	Same as R252	11 K 1/4 W ±5% Resistor
IC201	SN7400N	ICS
IC202	SN7400N	ICS
IC203	MC846P	ICS
S201	P.B.P.C. 400	Switch
S202	P.B.P.C. 400-03	Switch
S203	P.B.P.C. 400-05	Switch
	MPF 4003	Transistor Sockets
	314-AG5-2R	IC Sockets
	50D585	Front Panel
	NP6122 Vemaline	PAWL Latch
P402	50K4708	Timer Plug
	3516 Alpha	Cable

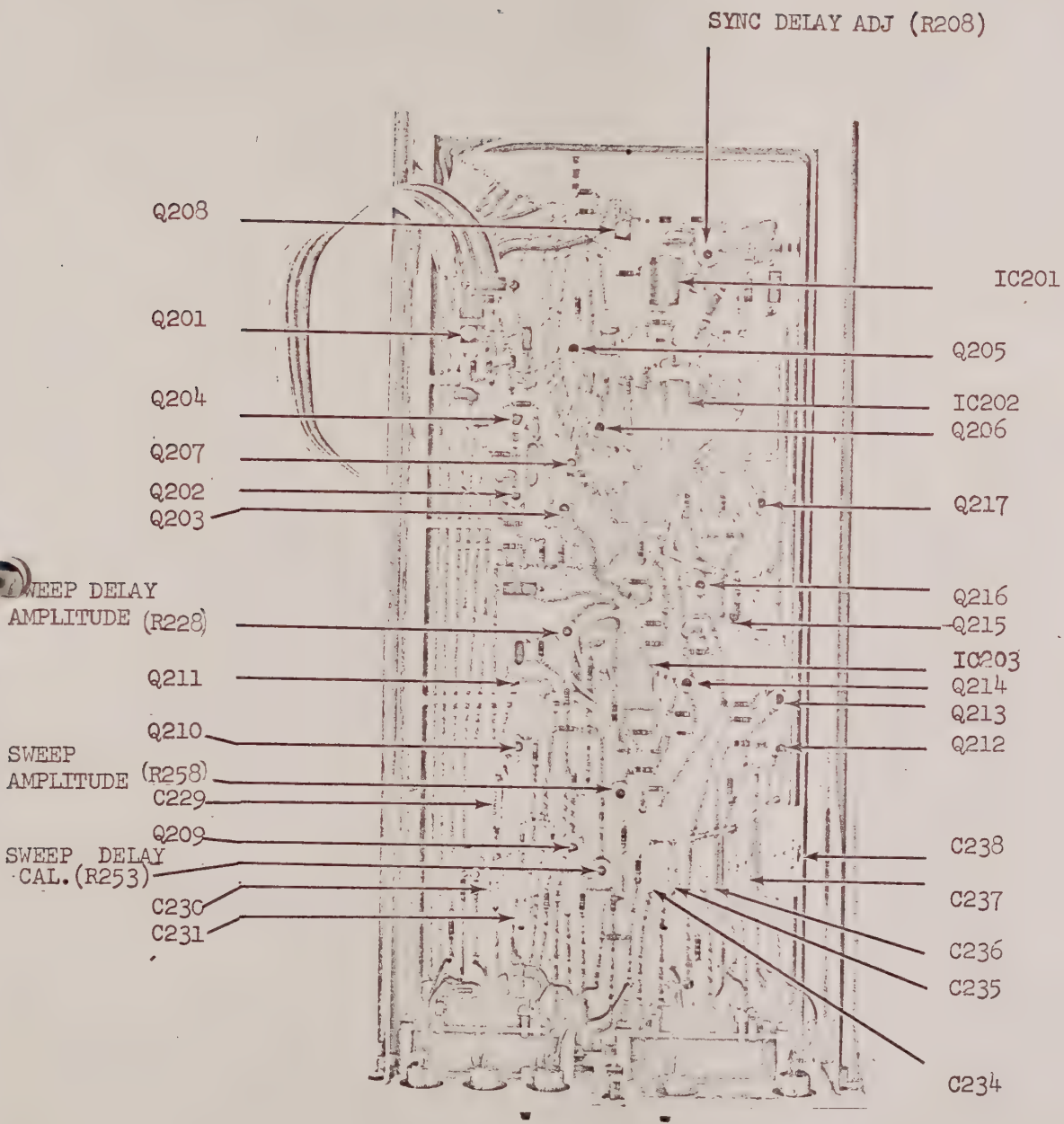


Figure A-1 Timer - A Transistors and alignment controls identification

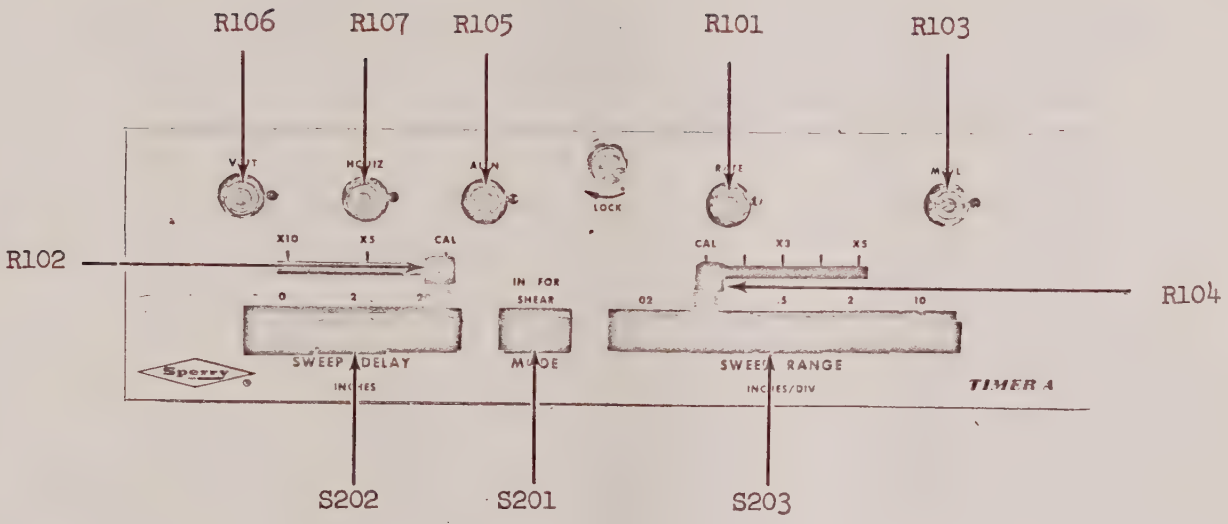


Figure A-2 TIMER-A Front panel parts control identification

APPENDIX B

SCHEMATIC

B1.0 INTRODUCTION

B1.1 This section contains a fold out No. 50D587 for the Timer A Unit. This section is supplied to supplement the information presented in the TEXT.

B1.2 The schematic is laid out to show the overall circuit function of the Timer A. The schematic provides technical information about the electrical value and identification of the capacitors, resistors, transistors, integrators and etc. Input, output, voltages and signals are shown on the schematic. The Timer-A P. C. Board Assembly, via plug P402 (16 pin connector), is connected to the UM-771/775 Reflectoscope Deflection Amplifier P. C. Board Assembly No. 50D569.

B1.3 The heavy dotted lines around a circuit (except IC Circuits) indicate controls on the front panel of the printed Board Assembly. Numbers identified as 100 series are front panel components and the 200 series numbers are P.C. Board components. The Timer-A is broken down into five electrical sections:

1. Power Regulators
2. Rate Generator
3. Synchronizing
4. Sweep Delay
5. Sweep

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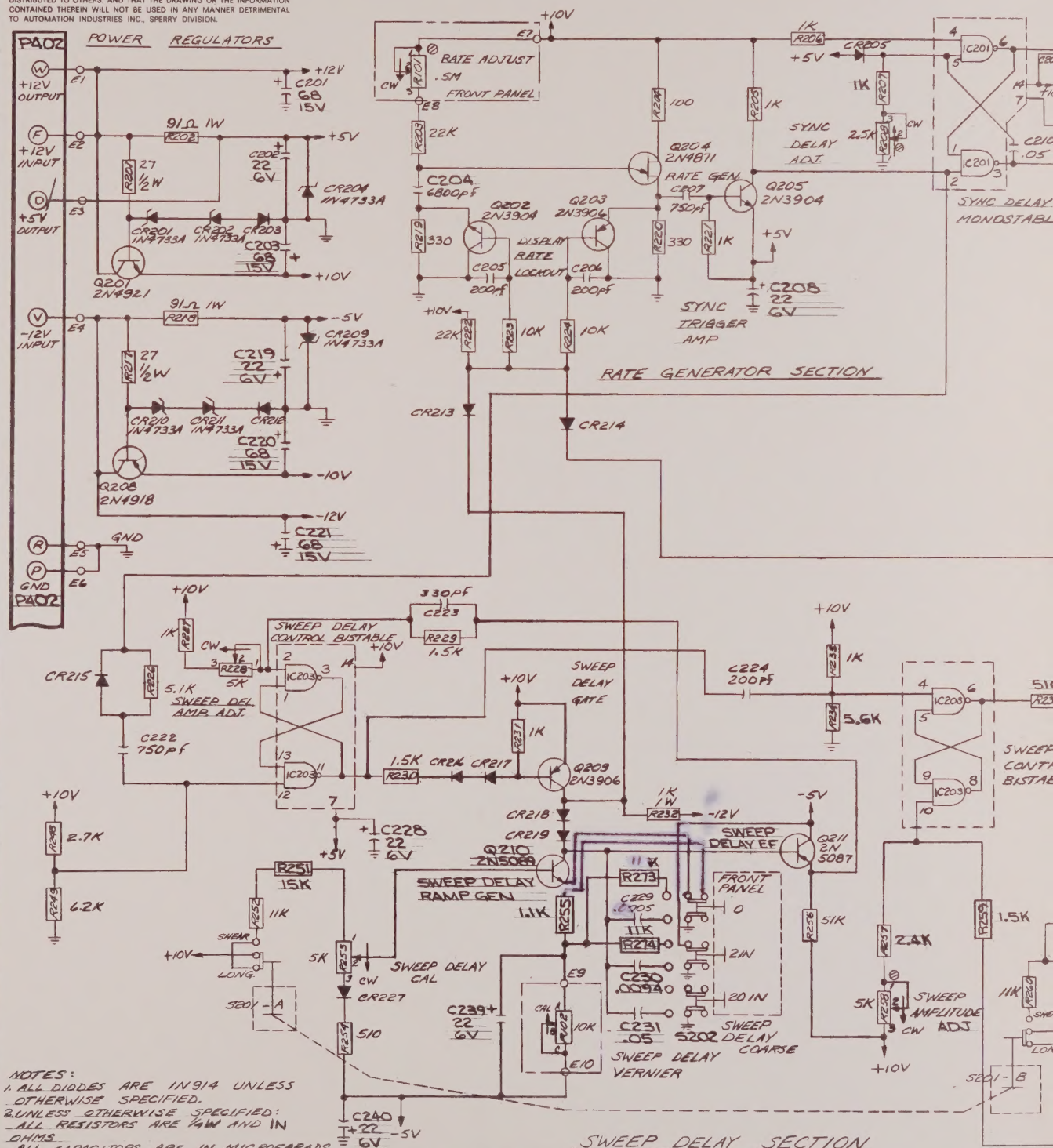


NOTES:
1. ALL DIODES ARE IN914 UNLESS OTHERWISE SPECIFIED.
2. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE ¼W AND IN OHMS. ALL CAPACITORS ARE IN MICROFARADS
3. MC846P, IC PIN 14 IS SUPPLY VOLTAGE, IC PIN 7 IS COMMON. IC201 AND IC202 ARE 7400, IC203 IS A MC846P OR EQUIV.

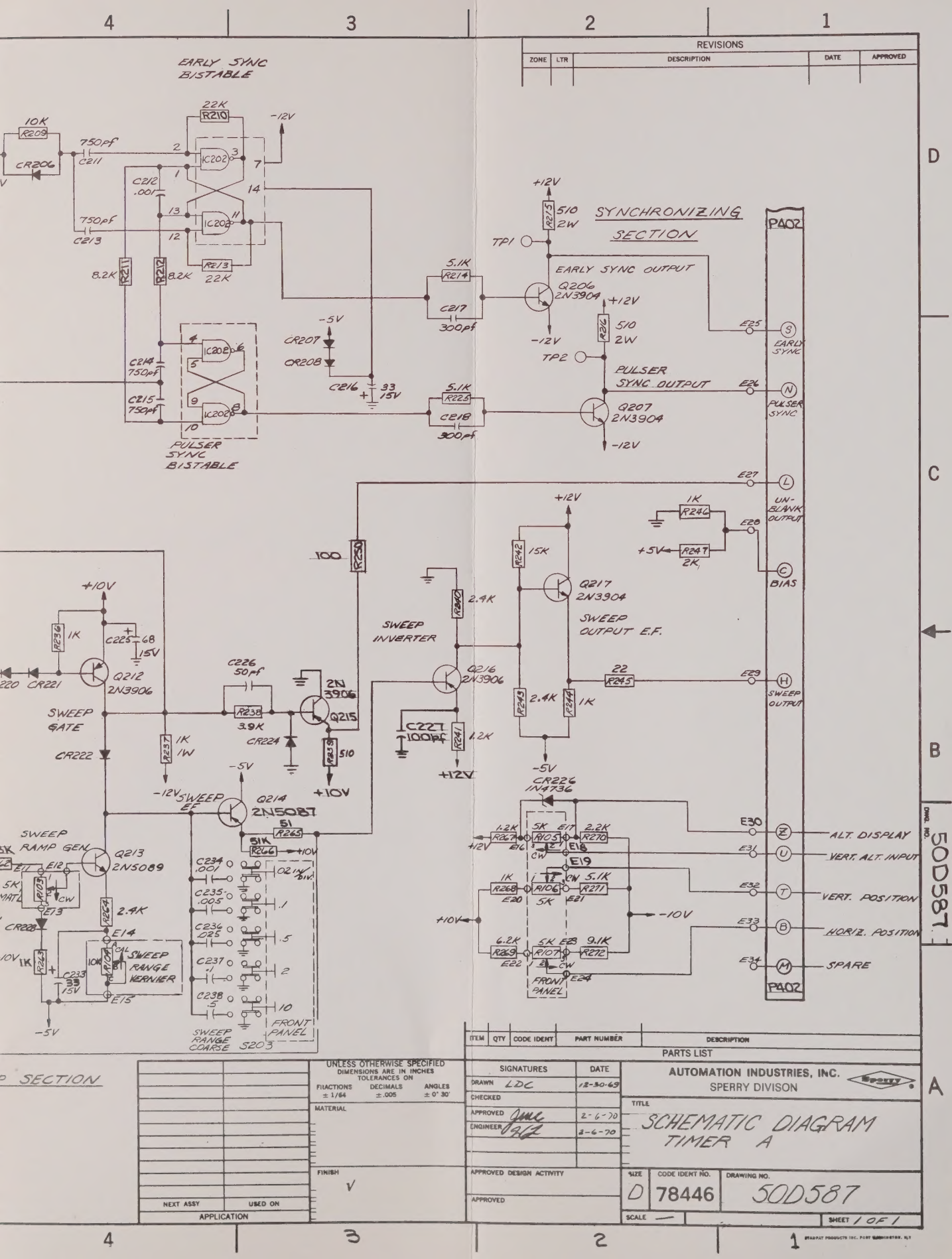
SWEEP DELAY SECTION

NUMBERS NOT USED

R	C	Q	CR	E	IC
	C232		CR223 CR225		

LAST NUMBERS USED

R	C	Q	CR	E	IC
R274	C240	Q217	CR228	E34	IC203


EARLY SYNC BISTABLE
PULSER SYNC BISTABLE
SYNCHRONIZING SECTION
EARLY SYNC OUTPUT
PULSER SYNC OUTPUT
SWEEP INVERTER
SWEEP OUTPUT E.F.
SWEEP GATE
SWEEP RAMP GEN
SWEEP RANGE VERNIER
SWEEP RANGE COARSE
FRONT PANEL
P402
ALT. DISPLAY
VERT. ALT. INPUT
VERT. POSITION
HORIZ. POSITION
SPARE
EARLY SYNC
PULSER SYNC
UN-BLANK OUTPUT
BIAS
SWEEP OUTPUT
REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVED
ITEM
QTY
CODE IDENT
PART NUMBER
DESCRIPTION
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 0° 30'
MATERIAL
FINISH
V
NEXT ASSY
USED ON
APPLICATION
SIGNATURES
DATE
DRAWN LDC 12-30-69
CHECKED
APPROVED 2-6-70
ENGINEER 2-6-70
APPROVED DESIGN ACTIVITY
APPROVED
AUTOMATION INDUSTRIES, INC.
SPERRY DIVISON
TITLE
SCHEMATIC DIAGRAM
TIMER A
SIZE D
CODE IDENT NO. 78446
DRAWING NO. 50D587
SCALE —
SHEET 1 OF 1
DWG NO. 50D587

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